

Claims

- [c1] What is claimed is:
1. A shallow trench isolation (STI) method for semiconductor processes, the method comprising:
- providing a substrate having a top surface;
 - forming a trench-patterned mask layer on the top surface exposing an unmasked trench region of the substrate, the mask layer comprising a pad oxide layer, and a silicon nitride layer formed on the pad oxide layer;
 - etching the unmasked region of the substrate to form a trench in the substrate;
 - depositing a high temperature oxide (HTO) film over the substrate, the HTO film covering the trench and the mask layer;
 - depositing a dielectric layer that fills the trench and covers the HTO film;
 - planarizing the dielectric layer to expose the silicon nitride layer; and
 - stripping the silicon nitride layer;
- wherein the HTO film reinforces an interface between the dielectric layer and the substrate to prevent acid penetration and acid-corroded seams forming during the acid solution dipping process.
- [c2] 2. The method of claim 1 wherein the HTO film is formed by a low-pressure chemical vapor deposition (LPCVD) process, the LPCVD process utilizing a $\text{SiH}_2\text{Cl}_2/\text{N}_2\text{O}$ gas system, a pressure of 0.4 Torr, and a temperature between 700 °C and 850 °C.
- [c3] 3. The method of claim 1 wherein the HTO film has a thickness between 50 and 250 angstroms.
- [c4] 4. The method of claim 1 wherein the dielectric layer is a high density plasma (HDP) oxide layer.
- [c5] 5. The method of claim 1 wherein before stripping the silicon nitride layer, the method further comprises performing a silicon oxide etching process to remove residual silicon oxide from the silicon nitride layer and to simultaneously etch the dielectric layer in the trench.
- [c6] 6. The method of claim 1 wherein the acid solution dipping process uses a

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100
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[c7]

7. The method of claim 1 wherein a 160 ° C phosphoric acid solution is used to strip the silicon nitride layer.